

**ABSTRACT OF THE DISCLOSURE**

An ultra-high density data storage device using phase-change diode memory cells, and having a plurality of emitters for directing beams of directed energy, a layer for forming multiple data storage cells and a layered diode structure for detecting a memory or data state of the storage cells, wherein the device comprises a phase-change data storage layer capable of changing states in response to the beams from the emitters, and a second layer forming one layer in the layered diode structure, the second layer comprising a material containing copper, indium and selenium. A method of forming a diode structure for a phase-change data storage array, having multiple thin film layers adapted to form a plurality of data storage cell diodes, comprises depositing a first diode layer of CuInSe material on a substrate[[]] and depositing a second diode layer of phase-change material on the first diode layer.